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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 27 MAR 2003

WIPO PCT

Applicant's or agent's file reference mj87	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International Application No. PCT/AU02/01121	International Filing Date (day/month/year) 21 August 2002	Priority Date (day/month/year) 28 June 2002
International Patent Classification (IPC) or national classification and IPC Int. Cl. ⁷ B41J 2/05, B81B 7/04		
Applicant SILVERBROOK RESEARCH PTY LTD et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheet(s).

3. This report contains indications relating to the following items:

- | | |
|------|---|
| I | <input checked="" type="checkbox"/> Basis of the report |
| II | <input type="checkbox"/> Priority |
| III | <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| IV | <input type="checkbox"/> Lack of unity of invention |
| V | <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| VI | <input type="checkbox"/> Certain documents cited |
| VII | <input type="checkbox"/> Certain defects in the international application |
| VIII | <input type="checkbox"/> Certain observations on the international application |

Date of submission of the demand 2 December 2002	Date of completion of the report 19 March 2003
Name and mailing address of the IPBA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer STEPHEN CLARK Telephone No. (02) 6283 2781

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/AU02/01121

I. Basis of the report**1. With regard to the elements of the international application:***

- ☐ the international application as originally filed.
- ☒ the description, pages 1-25, as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☒ the claims, pages , as originally filed,
pages , as amended (together with any statement) under Article 19,
pages , filed with the demand,
pages 26,27, received on 21 February 2003 with the letter of 20 February 2003
- ☒ the drawings, pages 1-45, as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/AU02/01121

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims 1-8	YES
	Claims	NO
Inventive step (IS)	Claims 1-8	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-8	YES
	Claims	NO

2. Citations and explanations (Rule 70.7)Novelty (N), Inventive Step (IS) Claims 1-8

None of the citations alone, or in combination, disclose all of the features of any of the claims.

In particular, the MEMS fabrication techniques combined with the other features was not found.

US 6352337 is the closest citation and includes pusher displacement between 1 and 5 microns (see column 3 lines 40-46 where 4.5 microns is described for a certain size droplet). This citation does not describe MEMS techniques for fabrication of the nozzles.

We Claim:

1. An ink jet printhead chip that comprises
a substrate;
drive circuitry positioned in the substrate; and
a plurality of nozzle arrangements positioned on the substrate, each nozzle arrangement comprising
nozzle chamber walls and a roof wall that define a nozzle chamber and an ink ejection port in the roof wall in fluid communication with the nozzle chamber;
an ink pusher that is operatively positioned with respect to the nozzle chamber and is displaceable through a range of between 1 micron and 5 microns to eject ink from the ink ejection port; and
an actuator that is connected to the drive circuitry and the ink pusher to displace the ink pusher on receipt of an electrical signal from the drive circuitry, each nozzle arrangement being the product of a MEMS fabrication technique.
2. An ink jet printhead chip as claimed in claim 1, in which the ink pusher is displaceable through a range of between 1.5 microns and 3 microns.
3. An ink jet printhead chip as claimed in claim 1, in which each ink pusher is in the form of a paddle member that is positioned in the nozzle chamber to span the nozzle chamber.
4. An ink jet printhead chip as claimed in claim 3, in which each actuator includes an actuator arm that is fast with the substrate at one end and attached to the paddle member at an opposed end, the actuator arm incorporating a thermal bend mechanism that is configured to deflect when heated by said electrical signal from the drive circuitry to displace the paddle member.
5. An ink jet printhead chip as claimed in claim 4, in which each thermal bend

mechanism includes a portion of the actuator arm that is of a material having a coefficient of thermal expansion which is such that the material is capable of thermal expansion to an extent sufficient to perform work and an electrical heating circuit positioned on said portion of the actuator arm to heat a side of said portion so that said portion experiences differential thermal expansion resulting in deflection of the actuator arm and the displacement of the paddle member.

6. An ink jet printhead chip as claimed in claim 1, in which the roof wall defines the ink pusher.

7. An ink jet printhead chip as claimed in claim 6, in which each actuator includes an actuator arm that is fast with the substrate at one end and attached to the roof wall at an opposed end, the actuator arm incorporating a thermal bend mechanism that is configured to deflect when heated by said electrical signal from the drive circuitry to displace the roof wall towards the substrate.

8. An ink jet printhead chip as claimed in claim 7, in which the actuator arm is of a conductive material having a coefficient of thermal expansion which is such that the material is capable of thermal expansion to an extent sufficient to perform work, a portion of the actuator arm defining a heating circuit which is configured to expand thermally on receipt of said electrical signal, said portion of the actuator arm being positioned so that the actuator arm is deflected towards the substrate upon such deflection.